Copper In Drinking Water

April 1997
Fact Sheet
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Background

Copper is a natural constituent of soils. It is an essential mineral nutrient for humans and plants. Copper is present in numerous mined minerals including cuprite, malachite, azurite, and chalcopyrite. Occasionally it is found in the earth as the metal.

Industrial pollution, domestic wastewater, mining wastewater, and weathering of copper bearing rocks are major sources of copper in surface and ground waters. Discharges of copper into sewer systems from some residential areas is significant.

Leading areas of use for copper and its alloys are the plumbing, electrical, and electronic industries. Copper compounds are used as agricultural fungicides, algicides in water reservoirs, and in food supplements and fertilizers.

Public Health Issues

Major food sources of copper are shellfish, nuts, grains, leafy vegetables and stone fruits. Human intake of copper from food is estimated to range from less than 2 milligrams (mg) to 5 mg per day.

Copper is essential for many enzymatic reactions within the human body. Two to three milligrams per day are recommended by the National Academy of Science as “a safe and adequate intake” for proper body function. Ingestion of a single dose of 15 mg of copper has caused nausea, vomiting, diarrhea and intestinal cramps. Severe cases of copper poisoning have led to anemia and to the disruption of liver and kidney functions. Individuals with Wilson’s and Menke’s disease (genetic disorders resulting in abnormal copper absorption and metabolism) are at higher risk from copper exposure than the general public. These persons can have neurological and other serious health problems. There is insufficient data to determine if copper causes cancer in humans.

Regulations in Drinking Water

In Washington, most copper in drinking water comes from corrosion of household plumbing. Public water supplies with more than 10 percent of overnight household tap water sample exceeding 1.3 ppm are required to conduct treatment and reduce corrosion. The amount of copper which can corrode overnight is affected by a variety of household conditions in addition to the quality of the drinking water in the tap. Flushing the water from the tap for 30 to 45 seconds can reduce the copper which accumulates due to the corrosion when the household plumbing is not in use.

The presence of copper in drinking water can often be noticed by blue-green stains on plumbing fixtures. Some factors that affect copper levels in household

drinking water are:

- Acidic water (low pH)
- Soft water (low in calcium and magnesium)
- High chlorine residual levels
- Long standing time in pipes
- Elevated water temperature

Based upon levels of copper found in water studies, the contribution from water to the total copper in the diet may vary from four to forty-five percent. Absorption studies have indicated that about half of the ingested copper is excreted in the feces. Such poor absorption provides an appreciable barrier against poisoning by ingestion. Copper is widely distributed within the body, but accumulates primarily in the liver and kidneys.

Backflow Prevention for Carbonated Beverage Dispensing Machines

Ingestion of carbonated or acidic beverages that have been in contact with copper tubing, fixtures or containers provide the greatest risk of acute exposure. The carbon dioxide used to carbonate soft drinks in dispensing machines is under pressure and where mixed with the incoming water can back flow a considerable distance through the incoming water supply. The most sure way to prevent the carbondioxide from contacting copper plumbing pipes is to install a reduced pressure backflow prevention assembly (RPBA). This assembly should be installed on the incoming water supply pipe immediately upstream from the carbon dioxide injection point. Copper piping should not be used downstream from the injection point. (Some utilities may allow the substitution of a dual check valve with an intermediate vent in place of the RPBA).

The following technologies are suitable for treating source waters.

- *Coagulation/Filtration* - Through conventional treatment processes, this method uses chemicals that produce a gelatinous precipitate when added to water. The precipitate acts as a coagulant to collect copper and other contaminants. The treated water is then filtered to remove the contaminated precipitate.

- *Ion exchange* - Ion exchange is the process used in home water softeners. Water passes through an ion exchange resin containing sodium. The resin removes copper and other positively charged ions from the water by exchanging them with sodium.

- *Lime softening* - This is a process that is used for softening water. Through the addition of lime, the alkalinity of the water is increased and copper as well as chemicals that cause hardness are removed from the water. Increasing the alkalinity also reduces the corrosive properties of the water.

- *Reverse Osmosis* - This method has been used to produce fresh water from sea water. Reverse osmosis utilizes pressure to force water through a semi-permeable membrane. Copper and numerous other contaminants are unable to pass through the membrane.